

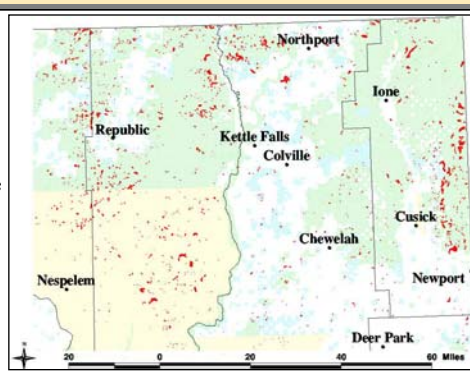
Ground Checking Aerial Survey Polygons Identified as Douglas-fir Beetle Caused Damage in Washington in 2001 and 2002

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Introduction:

Douglas-fir beetle *Dendroctonus pseudotsugae* (DFB) is one of the most significant tree killing insects in the Pacific Northwest. Its host is mature Douglas-fir (*Pseudotsuga menziesii*), which is a high value timber and ecological resource. DFB is a commonly identified damage agent in the annual comprehensive aerial forest damage detection surveys conducted by the USDA Forest Service Region 6 and the Washington Department of Natural Resources. In Washington, past efforts to ground check data produced from the annual aerial survey have been random and unfocused. In this study, researchers systematically ground-checked 117 DFB polygons (fig. 1) to evaluate accuracy and to provide feedback to the aerial observers. The survey was funded by an Evaluation Monitoring grant from the USDA Forest Service's Forest Health Monitoring Program.

Figure 1. The aerial insect and disease detection survey recorded these polygons of Douglas-fir beetle caused mortality in the study area in 2002.



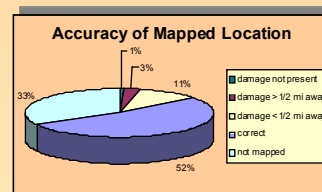
Methods:

A DFB outbreak has been occurring in northeastern Washington since 1998. The vicinity of Republic, Washington was chosen as a study site because high numbers of DFB polygons were likely to be identified in aerial surveys and fairly good access is possible by road. A retired DNR technician with extensive experience with aerial survey was hired to conduct the ground checking. Both large and small polygons, with a limit of no more than 2 per section, were to be evaluated. One hundred seventeen (117) polygons were evaluated in this study.

The polygon's were evaluated on the following:

- Mapped location and shape.
- The number, species, and size of affected trees.
- The cause of the actual damage.
- Presence of other factors such as older dead trees which would act as barriers to detection from the air.

Comparisons were then made to information provided on the aerial survey map.

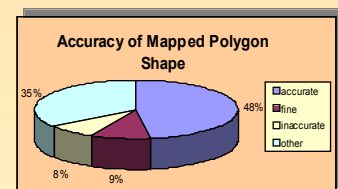


Polygon Location:

Of the polygons evaluated, sixty were mapped in the correct place and fourteen were less than 1/2 mile from the damage on the ground. One polygon depicted on the map could not be located. Three mapped polygons were shown more than 1/2 mile from the damage on the ground. Thirty-nine damaged areas viewed from the ground did not correspond to mapped polygons. The polygons that were seen from the ground but unmapped (n = 39) were fairly small, discrete groups of trees (average number of trees per polygon = 21.64).

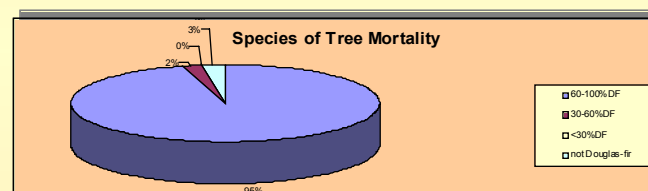
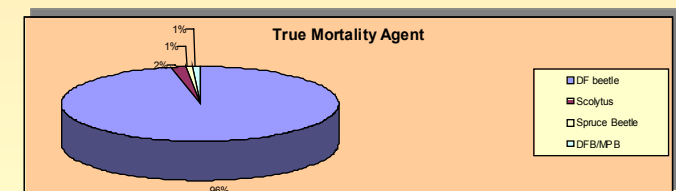
Polygon attributes:

The size and shape of fifty-seven of 77 polygons (74%) which were mapped and could be evaluated were classified as "accurate." Eleven (14%) were classified as "fine" and 9 (12%) were classified as "inaccurate."



Causal Agent Identification:

The causal agent of mapped damage was correctly identified as DFB 97% of the time. Although DFB was the dominant mortality agent active in the area, other damage seen from the ground was true fir (*Abies spp.*) killed by either fir engraver beetle (*Scolytus ventralis*) or western balsam bark beetles (*Dryocoetes spp.*); Engelmann spruce (*Picea engelmannii*) killed by spruce beetle (*Dendroctonus rufipennis*); and lodgepole pine (*Pinus contorta*) killed by mountain pine beetle (*Dendroctonus ponderosae*).



Host Identification:

The dead trees were correctly identified as mature Douglas-fir in 74 of 77 (96%) mapped polygons. In two polygons the dead stands were only 30 to 60% mature Douglas-fir (once the mature DF were mixed with younger DF; once the mature DF were mixed with dead lodgepole pine). One unmapped polygon was actually comprised of dead mature true fir.

Discussion and Findings.

Even with modern GPS tools, it is extremely difficult to evaluate the accuracy of an aerial view from from the ground, particularly in complex topography. It was also extremely difficult for the ground observer to assess the quality of the mapped polygon when he had just a partial view of the landscape.

This DFB outbreak has been going on in the study area for several years, and older dead trees were common on the landscape. A significant number of older dead trees were present in the immediate vicinity of most polygons (59%) which may have affected observer judgments.

If "success" is defined as correctly mapping damage polygons within 1/2 mile of the actual damage, the results of this study indicate a 63% mapping success. Larger numbers of dead trees were successfully mapped 96% of the time. The mapped polygon shape, tree composition, and damage agent were highly accurate.

Although the intent of the survey is to report only current mortality (trees likely killed the previous year, but displaying a signature of discolored foliage during the survey period), about 10% of the time dead trees in the area may have influenced observers to over-report numbers of trees killed.

If funds were available, helicopters would be superior vehicles from which to evaluate aerial sketchmapping and aid ground-checking of aerial survey polygons.

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